

## REMARKS

Entry of this Amendment under 37 CFR §1.116 is respectfully requested. Claims 45, 46, 48, 52, and 54 are currently amended. Claims 23-33, 51 and 53 are canceled. Claims 1-22, 34-50, 52 and 54 are pending in the application.

Claims 45 and 48 have been amended to incorporate the limitations of respective dependent claims 52 and 54. Claim 46 has been amended to overcome the outstanding rejection under 35 USC §112, second paragraph. No new issues have been raised. Hence, entry of this Amendment is proper under 37 CFR §1.116.

Applicant acknowledges with appreciation that the Restriction Requirement has been withdrawn.

Applicant acknowledges with appreciation that the objection to the claims reciting “configured for” has been withdrawn. Regarding the statement that “configured for” does not guarantee an outcome, it is well settled that recital of “configured for” refers to a specific structural limitation that cannot be disregarded.<sup>1</sup>

### Information Disclosure Statements

Applicant respectfully requests under MPEP 609 an initialed copy of the Information Disclosure Statement (IDS) (forms PTO-1449) filed January 7, 2004, as indicated on page 5 of the Final Action, as neither the Final Action nor the USPTO Image File Wrapper have copies of the initialed IDS form PTO-1449 filed January 7, 2004. A copy received by the undersigned via facsimile on October 17, 2007 is not acceptable because the citations are both crossed out and initialed, contra to the requirements of MPEP 609.05(a) and MPEP 609.05(b), rendering unclear

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<sup>1</sup>See, e.g., MPEP § 2173.05(g) and *In re Venezia*, 530 F.2d 956, 189 USPQ 149 (CCPA 1976), holding that limitations such as “members adapted to be positioned” and “portions ... being resiliently dilatable whereby said housing may be slidably positioned” serve to precisely define present structural attributes of interrelated component parts of the claimed assembly. *Accord*, *Pac-Tec Inc. v. Amerace Corp.*, 14 USPQ2d 1871, 1876 (Fed. Cir. 1990)(functional language such as “adapted to”, “whereby”, and “thereby”, for example, constitute structural limitations).

whether the references were actually considered. The Examiner is respectfully requested to initial a clean copy of the form PTO-1449 filed January 7, 2004 (or in the alternative, the form PTO-1449 filed July 14, 2006).

In the alternative to the Examiner initialing a clean copy of the form PTO-1449 filed January 7, 2004, Applicant requests under MPEP 609 an initialed copy of the IDS filed July 14, 2006, which was submitted in accordance with §1.97(c)(2). The IDS filed July 14, 2006 does identify the relevant pages of the publications, namely all the pages. No concise explanation of relevance is further required because the publications are in English (see 37 CFR §1.98(3)(1)). Further, relevance of all the pages is established at page 1, lines 20-23 for the Internet Draft by Johnson et al.,<sup>2</sup> and at page 11, lines 1-5 of the specification for the UML Specification.<sup>3</sup> Neither the Patent Office Rules nor the MPEP impose a limit on the size of references submitted in an Information Disclosure Statement. Hence, an initialed copy of the July 14, 2006 form PTO-1449 is respectfully requested.

Applicant further requests under MPEP 609 an initialed copy of the IDS filed June 28, 2006, which was submitted in accordance with 37 CFR §1.97(c)(1) and §1.97(e)(1).

#### The §102 Rejection of Claims 45 and 48

Claims 45-54 were rejected under 35 USC §102(b) in view of Sibley et al., "Robomote: A Tiny Mobile Robot Platform for Large-Scale Ad-hoc Sensor Networks". This rejection is respectfully traversed.

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<sup>2</sup>A "Mobile IPv6" protocol is disclosed in an Internet Draft by Johnson et al., entitled "Mobility Support in IPv6", available on the World Wide Web at the address: <http://www.ietf.org/internet-drafts/draft-ietf-mobileip-ipv6-24.txt> (*the disclosure of which is incorporated in its entirety herein by reference*).

<sup>3</sup>Figure 3 is written in accordance with the Uniform Modeling Language (UML) Specification Ver. 1.5, March 2003, published by the Object Management Group and available on the World Wide Web at the website address "<http://www.omg.org/uml>" and more specifically at the address "<http://www.omg.org/docs/formal/03-03-01.pdf>", *the disclosure of which is incorporated in its entirety herein by reference*.

Each of the independent claims 45 and 48 as amended from canceled claims 51 and 53 specify receiving network attribute information, and determining a ***movement directive*** based on an ***optimization of routing metrics*** relative to the received network attribute information ***and according to a prescribed routing protocol***. A mobility platform is configured for implementing “the optimization” (of routing metrics) by causing a physical change for the network node in response to the movement directive.

Hence, the independent claims 45 and 48 as amended precisely specify that the execution of the optimization of routing metrics ***according to a prescribed routing protocol*** causes the determination of the movement directive.

#### ***Broadest Reasonable Interpretation***

As described at page 6, lines 21-24, page 7, line 30 to page 8, line 12 of the specification, a routing protocol in the network node considers movement of its physical platform as an option to optimize routing metrics; since the routing metrics characterize the overall network, the optimization of routing metrics results in the optimization of the network:

As described above, the routing protocol of the disclosed embodiment considers movement of its physical platform as an option to optimize routing metrics. Hence, the routing resources of each mobile node include movement of its physical platform, and all factors and consequences associated with executing decisions related to movement, ***as part of the decision-making process to determine how to respond to inputs, including how to route data packets***. Each of these factors are also shared among the mobile nodes 12 to provide a level of understanding between all the mobile nodes 12 as to the state of the network 10 from the perspective of each of the individual nodes 12.

Hence, each of the mobile nodes 12 ***decide how to route packets, and move their respective mobility platforms***, based on the available information from local sensors and information shared between the other mobile nodes. Consequently, ***the mobile network 10 becomes a dynamic entity where the individual mobile nodes 12 interact to route packets, establish connections among each other, and move at selected velocities as needed, based on shared information and detected information***.

(Page 7, line 30 to page 8, line 12 of specification).

Further, the specification describes in detail that the routing resource generates the claimed movement directive, based on executing optimization based on generating a force vector ( $F_v$ ). As described in the specification, the object oriented routing resources 20 includes a world object database 100 (Figure 3) that includes smart world objects 110, where each smart world object owns a brain object 112, and each brain object 112 owns a set of reaction objects (i.e., “reactions”) 114 (e.g., page 13, lines 1-3). As illustrated in Figure 9, the brain object 112 executes a decision by generating a force vector ( $F_v$ ) based on advice elements (e.g., A1, A2, A3) generated by the reaction objects 114 reacting to various stimuli objects (page 13, lines 7-12; page 18, line 9 to page 19, line 10): the force vector ( $F_v$ ) is used to modify the velocity vector 64 (page 19, lines 4-17). The velocity vector 64 causes the motor complex object 58 (see Fig. 8) within the robot object 56 of Figs. 8 and 9 to attempt to ***move in the direction and speed specified by the velocity vector*** (to minimize the velocity vector) by outputting a movement directive to the mobility platform 22 (page 17, lines 19 to page 18, line 5).

Hence, the broadest reasonable interpretation of “determining a movement directive based on executing an optimization of routing metrics relative to the received detected attribute information and according to a prescribed routing protocol” in claims 45 and 48 cannot be inconsistent with the specification,<sup>4</sup> which requires the routing protocol to generate the claimed movement directive based on executing the optimization (e.g., decision) that requires a change in movement (see also page 4, lines 20-23 and page 8, line 30 to page 9, line 4), and requires the mobility platform to respond to the movement ***directive*** to implement the optimization having been executed according to the routing protocol. In other words, the broadest reasonable interpretation requires the routing protocol to execute an optimization of routing metrics that results in generation of a movement directive.

These and other features are neither disclosed nor suggested in the applied prior art.

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<sup>4</sup>“During patent examination, the pending claims must be ‘given their broadest reasonable interpretation consistent with the specification.’” MPEP §2111 at 2100-46 (Rev. 3, Aug. 2005) (quoting *In re Hyatt*, 211 F.3d 1367, 1372; 54 USPQ2d 1664, 1667 (Fed. Cir. 2000)).

*Sibley*

Contrary to the assertions in the Final Rejection, Sibley provides no disclosure or suggestion whatsoever of “determining a ***movement directive*** based on ***executing*** an ***optimization*** of routing metrics relative to the received detected attribute information ***and according to a prescribed routing protocol.***” In fact, Sibley provides no disclosure or suggestion that the routing protocol ***executes an optimization of routing metrics*** that results in generation of a movement directive. To the contrary, Sibley discloses no more than a non-enabling disclosure of mounting a network node on a “Robomote”<sup>5</sup> that can be moved to locations of different signal strength under the control only of the Robomote control software (“Renemote”), with no disclosure or suggestion that the ***ad hoc routing protocol*** participates in generating the movement directive.

In particular, Sibley describes that the Robomote usefulness is to replace people carrying wireless laptops (where the *laptops* are connected via an ad hoc routing protocol), where the people are moving within a fixed area to improve signal quality:

Most sensor network research uses fixed networks. Robomotes allow certain types of fixed wireless networks [] to overcome this barrier. The Robomote makes the network topology dynamic, and thus truly ad hoc. As a simple example of Robomote usefulness as a research platform to the ad-hoc networking community, consider using Robomote as **a test bed** for ad hoc routing protocols. It would be difficult to assemble hundreds of laptops with 802.11b cards and ***have people move them randomly in a fixed area.*** Further, such a study would require a massive space. On the other hand, it would be trivial to do this using Robomotes.

*Consider* a network with a dynamic topology that actively moves nodes in order to maximize (or minimize) some characteristic (see Figure 2). For example a network that autonomously moves nodes to locations of low [sic] signal strength to improve

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<sup>5</sup>“Most sensor network research uses fixed networks. Robomotes allow certain types of fixed wireless networks [] to overcome this barrier. ***The Robomote*** makes the network topology dynamic, and thus truly ad hoc.” Sibley at page 1147, Sec. IV, para. 3, lines 3-7) (citations omitted).

throughput along a multi-hop transmission path []. While such work is possible with currently available robot platforms (or human-laptop mobile nodes), it is not realistic to do on the scale of hundreds of nodes. Robomotes make such research practical.

(Page 1147, col. 1, Sec. IV, para. 3, line 3 to col. 2, end of first para.)

The disclosed proposal of using the Robomote as a “test bed for ad-hoc routing protocols” explicitly demonstrates that there is no disclosure to actually *modify* any existing ad hoc routing protocols, but rather to test ad hoc routing protocols. Further, the above quote from Sibley demonstrates that any attempt to move the nodes to “maximize (or minimize)” some characteristic (see Figure 2)” to maintain network connectivity (see Figure 2 description on page 1144) is distinct from the ad hoc routing protocol, since Sibley equates such movement as already possible with currently available robot platforms or human laptop mobile nodes.

Moreover, Sibley describes on pages 1144-45 (Section C) that page 1144 (starting at second column, last paragraph) that its proposal to move nodes to maintain network connectivity based on received signal strength is non-enabling and speculative:

“[L]ocalization [] based on the received signal strength indication (RSSI) of other Robomote radio communications ... has [mixed success] and *it is not clear whether accurate localization based on radio signal strength is useful*. Ultimately, localization and navigation in mobile sensor actuator networks *is still an open question* - as is mobile robot localization and navigation in general. [Citations omitted]

Hence, Sibley disclose no more than the local Robomote control software possibly controlling movement of the Robomote based on the RSSI. As admitted by Sibley, however, the disclosure is non-enabling because “it is not clear whether accurate localization based on radio signal strength is useful.” Hence, the §102 rejection must be withdrawn because Sibley fails to provide a sufficiently detailed disclosure that would enable one of ordinary skill in the art to make and use the claimed subject matter without undue experimentation.<sup>6</sup>

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<sup>6</sup>A rejection for anticipation requires that the four corners of a single prior art document describe every element of the claimed invention, either expressly or inherently, such that a person

Even if one skilled in the art deemed Sibley to be an enabling disclosure, Sibley describes no more than local Robomote control software possibly controlling movement of the Robomote by trial and error based on the RSSI. Hence, the movement of individual nodes still is independent and distinct from the disclosed ad hoc routing protocol, as evidenced by the repeated statements that the Robomote is intended to enabling testing of *existing ad hoc routing protocols*. The statement at the bottom of page 1147, col. 1 that “a *network* that autonomously moves nodes” is not a disclosure of a *routing protocol* (that establishes connectivity *within* the network) controls the movement of the nodes. Such vague statements in the applied reference are insufficient to establish anticipation under §102.<sup>7</sup>

Moreover, any suggestion of moving a network node in Sibley *still* relies on a feedback system that relies on trial-and-error measurement to determine whether the movement actually resulted in an optimization. There is no disclosure or suggestion of Sibley executing an *optimization of routing metrics* that results in generation of a movement directive, as claimed. In fact, Sibley discloses the exact opposite: moving a device in an attempt to improve or maintain network connectivity.

Hence, Sibley fails to disclose or suggest that the *routing protocol* should execute an optimization of routing metrics resulting in generation of a movement directive, as claimed, and

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of ordinary skill in the art could practice the invention without undue experimentation. *See In re Paulsen*, 30 F.3d 1475, 1478-79, 31 USPQ2d 1671, 1673 (Fed. Cir. 1994) (*citing In re Spada*, 911 F.2d 705, 708, 15 USPQ2d 1655, 1657 (Fed. Cir. 1990); *In re Arkley*, 455 F.2d 586, 587, 172 USPQ 524 (CCPA 1972) (“the reference ... must clearly and unequivocally disclose the claimed [invention] or direct those skilled in the art to the [claimed invention] without any need for picking, choosing and combining various disclosures not directly related to each other by the teachings of the cited reference.”).

<sup>7</sup>“Anticipation requires the presence in a single prior art reference disclosure of each and every element of the claimed invention, arranged as in the claim.” *Lindemann Maschinenfabrik GmbH v. American Hoist & Derrick Co.*, 221 USPQ 481, 485 (Fed. Cir. 1984). “Anticipation cannot be predicated on teachings in the reference which are vague or based on conjecture.” *Studiengesellschaft Kohle mbH v. Dart Industries, Inc.*, 549 F. Supp. 716, 216 USPQ 381 (D. Del. 1982), *aff’d.*, 726 F.2d 724, 220 USPQ 841 (Fed. Cir. 1984).

any assertions to the contrary in the Final Rejection are insufficient to overcome the deficiencies in the applied reference. “A prior art patent is a reference only for that which it teaches.” *Corning Glass v. Sumitomo Electric*, 9 USPQ2d 1962, 1970 (Fed. Cir. 1989). For these and other reasons, the §102 rejection must be withdrawn.

### The §103 Rejection

Claims 1-22 and 34-44 stand rejected under 35 USC §103 in view of Burden, “Routing in the Internet” in view of Sibley et al. This rejection is respectfully traversed.

Applicant objects to the final rejection because it fails to establish what should be considered the **broadest reasonable interpretation** of the claim language. To the contrary, the final rejection demonstrates a **blatant disregard** for the requirement of *in re Van Geuns* of interpreting claims in light of the specification by dismissing explicit examples presented in the July 14, 2006 Amendment of the specification illustrating the claimed “smart world objects” and “sensor objects”, and asserting that the claimed smart world object that is “configured for ***generating decisions*** based on evaluation of selected world objects” is taught in Burden by “the individual *fields* of each entry/row” and “the system is ‘evaluating’ the table for effective routing”: this statement not only lacks coherence, it is completely unfounded because there is no reference in Burden to any “evaluating”, or any “effective routing”.

Further, the final rejection demonstrates an improper disregard for the explicit claim language that the network node includes a “world object database that ***stores world objects***,” “the world object database including smart world objects ***as a subclass of the world objects*** and configured for generating decisions....” Consequently, the improperly disregards the explicit claim language that the ***smart world objects are stored in the world object database as a subclass of world objects***.

The broadest *reasonable* interpretation cannot be inconsistent with the specification. As described in the specification, the world object database provides an object-oriented model for all objects in the world (e.g., page 10, lines 25-26; page 19, lines 4-6). As described *supra* on page 15 and as illustrated in Figure 3, each smart world object 110 owns an object called a brain 112,

and each brain 112 owns a set of reactions 114. Brains 112 are Java-based executables configured for “thinking” (in a heuristic manner) about the advice of each reaction 114, and then suggesting and forming a behavior or decision (in the form of a force vector ( $F_v$ )) of what should be done (e.g., page 13, lines 1-6; page 18, line 9 to page 19, lines 17). As illustrated in Figure 9, each smart world object 110 owns a corresponding Java-based robot object 56 (page 17, lines 11-14 and 19-30).

Hence, the broadest reasonable interpretation of “smart world objects as a subclass of the world objects and configured for generating decisions based on evaluation of selected world objects” cannot be inconsistent with the specification, which explicitly specifies that the smart world objects include Java-based executable objects, within an object-oriented model, that generate their own decisions.

Hence, the assertion on page 4 of the Final rejection that “the individual fields of each entry row” is a teaching of a “smart world object” is unfounded because the rejection fails to establish the basis for interpreting the claimed “smart world object” as encompassing “the individual fields of each entry/row”. Further, this interpretation in the Final rejection directly conflicts with detailed explanations in the specification describing the claimed “world objects” on pages 9-13 as object-oriented models of all objects in n-dimensional vectors that can be transformed based on transformational matrices 130 that can map into different vector spaces (e.g., page 9, lines 15-16; page 11, lines 12-13 and 25-29; page 12, lines 20-23).

Finally, the assertion on page 4 that the “smart world object” is taught (on the one hand) by “individual fields of each entry/row”, and (on the other hand) by an unfounded “system [] ‘evaluating’ the table for effective [sic]” is unfounded, inconsistent, and nonsensical.

Hence, the interpretation of “smart world object” in the Final rejection conflicts with the specification, and is therefore unreasonable.

Further, the Final rejection disregards the interpretation that those skilled in the art would reach: attached as Exhibit A is a Wikipedia Article entitled “Object-oriented programming”, retrieved October 17, 2007 from the World Wide Web from the website URL address: “[http://en.wikipedia.org/wiki/Object-oriented\\_programming](http://en.wikipedia.org/wiki/Object-oriented_programming)”. As described on page 1 of

Exhibit A, object-oriented programming implements executable programs using “objects” that include features such as inheritance (see, e.g., page 9, lines 9-11; page 11, lines 5-9 of the specification). Further, Exhibit A describes object-oriented programming as a collection of *cooperating objects*:

Object-oriented programming [OOP] may be seen as a collection of cooperating objects, *as opposed to a traditional view in which a program may be seen as a list of instructions to the computer*. In OOP, each object is capable of receiving messages, *processing data*, and sending messages to other objects. ***Each object can be viewed as an independent little machine with a distinct role or responsibility.***

Hence, the broadest reasonable interpretation of “smart world objects” cannot be inconsistent with the interpretation those skilled in the art would reach, namely independent executable objects (“little machines”) operating independently of each other and processing data.

Consequently, the assertion in the Final rejection that the “smart world object” is taught (on the one hand) by “individual fields of each entry/row”, and (on the other hand) by an unfounded “system [] ‘evaluating’ the table for effective [sic]” is unfounded, inconsistent, and nonsensical.

Hence, the interpretation of “smart world object” in the Final rejection conflicts with the interpretation those skilled in the art would reach, and is therefore unreasonable. *Cf. In re Cortright*, 49 USPQ2d 1464, 1468 (Fed. Cir. 1999).

As apparent from the foregoing, Burden discloses conventional Internet routing protocols that use conventional routing tables to store data: the data is *stored* and *retrieved* as needed by the host. Further, the routing table does not store objects as in an object-oriented database, but consists simply of addresses and status identifiers in a simple table. Burden provides no disclosure or suggestion of storing objects in an object-oriented database (let alone one having “smart world objects” that can independently generate decisions).

For this reason alone, the §103 rejection should be withdrawn because the rejection fails to demonstrate Burden that teaches or suggests the claimed world object database including the

smart world objects configured for generating decisions based on evaluation of selected world objects.

As admitted by the Official Action, Burden does not disclose or suggest performing a change in at least one of position, velocity, orientation, or wireless communication characteristics of the network node based on detecting a world object specifying a directive based on at least one of the decisions.

As discussed above with respect to the §102 rejection, the rejection fails to demonstrate that Sibley discloses or suggests “a world object specifying a **directive** based on at least one of the decisions” **generated by the smart world objects**. Sibley discloses no more than a trial-and-error attempt to move a network node to maintain network connectivity; however, even Sibley admits that its teachings are non-enabling, since “it is not clear whether accurate localization based on radio signal strength is useful.”

Hence, even if one skilled in the art would have been motivated to modify Burden to include the teachings of Sibley, the hypothetical combination simply would mount a router on the robot of Sibley, and the robot of Sibley would perform trial-and-error adjustments with no interaction by the router. Hence, the rejection has to establish a prima facie case of obviousness because the rejection has failed to establish that “there was an apparent reason to combine the known elements *in the fashion claimed*.” *KSR Int’l v. Teleflex, Inc.* No. 04-1350, 550 U.S. \_\_\_, Slip. op. at 14, 82 USPQ2d 1385, 1396 (U.S. Apr. 30, 2007). Rather, the hypothetical combination teaches no more than “the predictable use of prior art elements according to their established functions,” *Id.*, with no disclosure or suggestion of the claimed features as a whole.

The rejection provides an argument why one skilled in the art would have combined the teachings of Burden and Sibley et al. *generally* (i.e., according to their predictable use); however, the rejection fails to provide any analysis of any “apparent reason” that one of ordinary skill in the art would have provided any improvements *beyond* (i.e., more than) the predictable use of Burden et al. and Sibley. et al. according to their established functions. *Id.*

As apparent from the foregoing, the hypothetical combination still neither discloses nor suggests the claimed smart world objects within the world object database, as a subclass of the

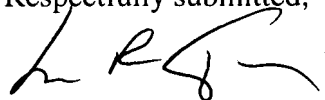
world objects, and configured for generating decisions, where detection of a world object specifying the directive causes performance of the claimed change. These claimed features provide "more than the predictable use of prior art elements according to their established functions". *KSR Int'l v. Teleflex, Inc.*, No. 04-1350, 550 U.S. \_\_\_, Slip op. at 13, 82 USPQ 2d 1385, 1396 (U.S. Apr. 30, 2007).

For these and other reasons, the §103 rejection of independent claims 1, 12, and 34 must be withdrawn.

In view of the foregoing, it is believed this application is in condition for allowance, and such as Notice is respectfully solicited.

To the extent necessary, Applicant petitions for an extension of time under 37 C.F.R. 1.136. Please charge any shortage in fees due in connection with the filing of this paper, including any missing or insufficient fees under 37 C.F.R. 1.17(a), to Deposit Account No. 50-1130, under Order No. 10-004, and please credit any excess fees to such deposit account.

Respectfully submitted,



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**Date: October 19, 2007**